***Competency* 2.5 Using references, personnel shall demonstrate knowledge of the purpose of the following DOE Orders:**

- **DOE Order 1540.3A, *Base Technology for Radioactive Material Transportation Packaging Systems***
- **DOE Order 5400.5, *Radiation Protection of the Public and the Environment***
- **DOE/EH-0256T (Revision 1), *Radiological Control Manual***
- **DOE Order 5480.11, *Radiation Protection for Occupational Workers***
- **DOE Order 5480.15, *Department of Energy Laboratory Accreditation Program for Personnel Dosimetry***

1. SUMMARY

DOE Order 460.2, *Departmental Materials Transportation and Packaging Management*	
NOTE: DOE Order 1540.3A, *Base Technology for Radioactive Material Transportation Packaging Systems*, has been superseded by DOE Order 460.2, *Departmental Materials Transportation and Packaging Management*. Contractors shall be directed to continue to comply with the requirements of Orders canceled by 460.2 until their contracts are modified to delete the reference to the requirements of the canceled Orders.	
Purpose	Establishes DOE policies and requirements to supplement applicable laws, rules, regulations, and other DOE Orders for materials transportation and packaging operations.
Scope	DOE and contractor personnel
Requirements/ Key Words	DOE Field Elements: • Shall conduct their operations in compliance with all applicable international, Federal, state, local, and tribal laws, rules, and regulations governing materials transportation that are not inconsistent with Federal regulations. • Shall ensure that a Transportation Plan consists of information describing material type, shipping dates, estimated number and weight of shipments, mode of transport, carrier proposed route, packaging description, and cargo security arrangements, if required, and submit it to the Office of Environmental Management (EM) with information on shipments of spent fuel, high-level waste, and high-visibility shipments and campaigns as determined by the cognizant program officer (PO).

DOE Order 460.2, *Departmental Materials Transportation and Packaging Management* (cont.)	
Requirements/ Key Words (cont.)	• Shall ensure that the DOE Transportation Tracking and Communications (TRANSCOM) System shall be used for tracking and monitoring the following categories of shipments in accordance with the TRANSCOM operations system manuals (controlled documents): - Spent nuclear fuel - High-level waste - High-visibility shipments and campaigns as determined by the cognizant secretarial officers • Shall use shipment procedures listed. • Shall ensure that shipments are inspected upon receipt for damage or loss and evidence of leakage. If a delivery conveyance is contaminated, the transport vehicle shall be detained and the delivery carrier immediately notified. • Shall send a return receipt registered letter to the state governor and, if necessary, the designated tribal point of contact, postmarked at least seven days before shipping spent fuel or high-level waste within or through a state or tribal jurisdiction. • Shall ensure that the state or tribe is notified by telephone of schedule changes that differ more than six hours from the information furnished in the written notification. • For each shipment of fissile or more than Type A quantities of radioactive material, and for gas poisonous by inhalation as defined in 49 CFR 173.115(c), the shipper shall notify the consignee of the dates of the shipment, the expected date of arrival, and any special loading or unloading instructions. • Shall notify the shipper by the end of the first working day after the estimated arrival date if the shipment has not been received. • Shall ensure that shipment data is reported to the Shipment Mobility/Accountability Collection (SMAC) automated data system at least monthly. • Before transporting new explosive substances and articles, including devices, made by DOE or under its direction or supervision, shall test them and obtain a classification approval. • Shall conduct compliance assessments of transportation and packaging operations no less than every three years at each DOE contractor facility. • Provide to EM-1 annually, information on reusable radioactive materials packagings in inventory, programmatically excess packagings, newly decertified packagings, new packaging needs, and packagings under development.
DOE Order 5400.5, *Radiation Protection of the Public and the Environment*	
Purpose	Outlines requirements to protect the public and the environment against undue risk of radiation due to operations of DOE and DOE contractor facilities.
Scope	DOE and DOE contractor facilities
Requirements/ Key Words	Chapter I, General Summary DOE is primarily adopting the International Commission on Radiation Protection (ICRP) 26/30 system of dose calculation, limitation, etc. The DOE primary standard is 100 mrem (EDE) in a year above background to members of the public from all pathways and sources. (This is reduced from the previous primary standard of 500 mrem in a year since it is already largely being achieved and it follows the ICRP recommendation.)

DOE Order 5400.5, *Radiation Protection of the Public and the Environment* (cont.)	
Requirements/ Key Words (cont.)	Chapter II, Requirements for Radiation Protection of the Public and the Environment The primary limit of 100 mrem (EDE) in a year is described in detail. The limit includes all pathways and sources and internal and external exposure. It does not include doses received from occupational exposures, naturally occurring background radiation, medical radiation, consumer products, or fallout. If justified, the public dose limit can be temporarily increased to 500 mrem through a request to EH-1. Chapter III, Derived Concentration Guides (DCGs) for Air and Water DCGs are concentrations of a radionuclide in air or water that, under conditions of continuous exposure for one year by one exposure mode (e.g., ingestion of water), would result in an effective dose equivalent of 100 mrem. These are not limits, but tools to be used in meeting the basic requirements. Chapter IV, Residual Radioactive Material Residual Radioactive Material: • Originally issued as guidance for Formerly Utilized Sites Remedial Action Program (FUSRAP) and Surplus Facilities Management Program (SFMP). • Chapter IV of DOE Order 5400.5 now applies DOE-wide. • Basic dose limit is 100 mrem above background effective dose equivalent in a year due to residual radioactive material. It is expected that the potential doses associated with actual or likely use of the released property will be a few mrem or less. This limit applies to all sources and pathways (excluding background and medical). The limits for radon and radon progeny are addressed separately. • Guidelines for residual radioactive material in soil shall be derived by environmental pathway analysis except for thorium (Th) and radium (Ra). The RESRAD computer program is recommended, but alternate procedures are acceptable.
Purpose	**NOTE:** The *Radiological Control Manual* was initially issued as a requirements document for all DOE facilities to follow with respect to radiation protection. It is now considered a guidance document and is in the process of being revised. Establish and maintain a system of regulatory policy and guidance reflective of national and international radiation protection standards and recommendations. Ensure that personnel responsible for performing radiological work activities are appropriately trained. Ensure the technical competence of personnel responsible for implementing and overseeing the Radiological Controls Program. Establish and maintain, from the lowest to the highest levels, line management involvement and accountability for departmental radiological performance. Ensure that radiological measurements, analyses, worker monitoring results, and estimates of public exposures are accurate and appropriately made.

DOE/EH-0256T (Revision 1), ***Radiological Control Manual***	
	Conduct radiological operations in a manner that controls the spread of radioactive materials, reduces exposure to the workforce and the general public, and utilizes a process that seeks exposure levels as low as reasonably achievable. Incorporate dose reduction, contamination reduction, and waste minimization features into the design of new facilities and significant modifications to existing facilities in the earliest planning stages. Conduct oversight to ensure that departmental requirements are being complied with and that appropriate radiological work practices are being implemented.
Scope	All Departmental elements
Requirements/ Key Words	Chapter 1 Excellence in Radiological Control Chapter 2 Radiological Standards Chapter 3 Conduct of Radiological Work Chapter 4 Radioactive Materials Chapter 5 Radiological Health Support Operations Chapter 6 Training and Qualification Chapter 7 Records
DOE N 441.1, ***Radiological Protection for DOE Activities***	
Purpose	Establishes radiological protection program requirements that, combined with 10 CFR 835 and its associated implementation guidance, form the basis for a comprehensive program for protection of individuals from the hazards of ionizing radiation in controlled areas. These requirements shall remain in effect pending completion of the department's rulemaking efforts to codify these or equivalent requirements.
Scope	This notice applies to all defense nuclear facilities classified as hazard categories 1, 2, or 3 that are subject to the requirements of 10 CFR 835, and to contractors that operate defense nuclear facilities.

Requirements/ Key Words	Administrative Control Levels A system of administrative control levels (ACLs) shall be implemented to control radiological worker doses at levels below the occupational exposure limits provided in 10 CFR 835.202. 1. A DOE ACL of 2 rem (0.02 Sv) total effective dose equivalent (TEDE) per year shall be implemented. No individual shall be permitted to receive an occupational exposure during planned activities that would result in exceeding the DOE ACL without the specific written authorization of the cognizant secretarial officer or designee. 2. A cumulative total effective dose equivalent (CTEDE) ACL of 1 rem (0.01 Sv) TEDE per year of age shall be implemented. When a radiological worker's CTEDE exceeds 1 rem TEDE per year of age, special ACLs shall be established during ensuing years as necessary to cause that individual's CTEDE to approach and, if possible, fall below 1 rem per year of age. 3. A facility-specific ACL shall be approved each year by facility management to maintain radiological worker doses below the DOE ACL. Written authorization by facility management shall be required prior to allowing any radiological worker's dose resulting from planned activities to exceed the facility-specific ACL. Work Authorizations Authorizations to work in radiological areas shall be in accordance with the RPP required by 10 CFR 835.101. This program, in part, shall describe a radiological work authorization program as specified in 835.501 that appropriately utilizes available work documents and procedures. The level of detail included in these documents shall be commensurate with the nature and magnitude of the hazard and complexity of the required controls. Radiation Safety Training 1. Radiation safety training for general employees, radiological workers, and radiological control technicians shall utilize those portions of the standardized core training materials published by DOE that are relevant to facility hazards and operations, augmented as necessary by site-specific materials. Documentation of satisfactory completion of the entire DOE standardized core course(s) shall be accepted by all DOE activities. 2. Training requirements commensurate with the hazard within a posted area shall be completed by an individual prior to permitting unescorted access to that area.

DOE N 441.1, *Radiological Protection for DOE Activities* (cont.)	
Requirements/ Key Words (cont.)	Posting Any accessible area in which radioactive material is used, handled, or stored shall be posted with the words "Caution, Radioactive Material." The posting shall meet the requirements of 10 CFR 835.601. The following areas are exempt from this posting requirement: 1. Areas containing 10 or fewer sealed radioactive sources with activities below the accountability criteria established in Attachment 1, Values for Exemption of Sealed Radioactive Sources from Inventory and Source Integrity Tests. 2. Areas containing only materials that are properly packaged and labeled for transport in conformance with Department of Transportation (DOT) regulations or corresponding DOE directives, and that are expected to enter into transportation in the immediate future (i.e., the current shift). 3. Areas under continuous observation and control of an individual knowledgeable of and empowered to implement required access control measures. Posting (cont.) 4. Areas posted as radiological areas in accordance with 10 CFR 835.603. 5. Other areas posted with radiological warning signs meeting the criteria established in 10 CFR 835.601. 6. Areas containing radioactive materials in quantities below the site- or facility-specified posting threshold. This threshold shall be established at a level below that which is likely to cause any individual to receive a TEDE in excess of 0.1 rem in a year. Control of Sealed Radioactive Sources 1. Administrative procedures shall be developed and maintained to control sealed radioactive sources having values equal to or exceeding those in Attachment 1 (i.e., accountable sealed radioactive sources). 2. Accountable sealed radioactive sources, or their storage containers or devices, shall be labeled with the standard radiation warning trefoil and the words, "Caution, Radioactive Material." 3. An individual shall be designated to maintain control of assigned accountable sealed radioactive sources. Prior to being designated, the individual selected shall be trained as a radiological worker in accordance with 10 CFR 835.902 and instructed on site-specific source control procedures. 4. Each accountable sealed radioactive source shall be inventoried at intervals not to exceed six months. A two-month grace period may be used to accommodate scheduling needs. This inventory shall establish: • The physical location of each accountable sealed radioactive source. • The adequacy of associated postings and labels. • The adequacy of storage locations, containers, and devices.

Requirements/ Key Words (cont.)	5. Each accountable sealed radioactive source having an activity exceeding 0.005 μCi shall be subject to a source integrity test upon receipt, when damage is suspected, and at intervals not to exceed six months. A six-week grace period may be used to accommodate scheduling needs. Source integrity tests shall be capable of detecting radioactive material leakage equal to or exceeding 0.005 μCi. 6. Notwithstanding the requirements of paragraph 6.e.(5), an accountable sealed radioactive source is not subjected to a periodic source integrity test if that source has been documented to have been removed from service. Such sources shall be stored in a controlled location, subject to periodic inventory as required by paragraph 6.e.(4) of this section, and subjected to a source integrity test prior to being returned to service. 7. Notwithstanding the requirements of paragraph 6.e.(4) and 6.e.(5), an accountable sealed radioactive source is not subject to periodic inventory and source integrity tests if that source is located in an area that is inaccessible to individuals due to operational or environmental constraints. <u>Exposure of Minors</u> The exposure of minors during direct onsite access to a DOE site or facility shall be controlled such that the dose to the extremities, lens of the eye, and other organs and tissues does not exceed 10% of the corresponding occupational exposure limits established in 10 CFR 835.202. Appropriate monitoring of external and internal dose shall be performed to demonstrate compliance with these limits. <u>DOE Laboratory Accreditation Program (DOELAP)</u> DOELAP shall be maintained consistent with the applicable DOE standards, and dosimetry programs shall be accredited at periodic intervals consistent with the standards. Additional guidance for the various program elements are contained in the DOELAP Technical Standard.

3. SELF-STUDY SCENARIOS/ACTIVITIES AND SOLUTIONS

Activity

Review the following Orders and Notices. Using the letters that correspond to the Order/Notice, match them with the statement that best describes the purpose, scope, or requirements. **NOTE:** The answers are site specific; therefore, there is not necessarily one correct answer.

A. DOE Order 1540.3A, *Base Technology for Radioactive Material Transportation Packaging Systems*

B. DOE Order 5400.5, *Radiation Protection of the Public and the Environment*

C. DOE/EH-0256T (Revision 1), *Radiological Control Manual*

D. DOE Order 5480.11, *Radiation Protection for Occupational Workers*

E. DOE Order 5480.15, *Department of Energy Laboratory Accreditation Program for Personnel Dosimetry*

F. DOE Notice 441.1, *Radiological Protection for DOE Activities*

G. DOE Order 460.2, *Departmental Materials Transportation and Packaging Management*

1. These Orders/Notices have been superseded by DOE N441.1. _____ _____ _____

2. This Order/Notice established training requirements for personnel responsible for performing radiological work activities. _____

3. This Order/Notice establishes the standard of 100 mrem EDE per year exposure above background for members of the public. _____

4. This Order/Notice has been superseded by DOE Order 460.2. _____

5. This Order/Notice and 10 CFR 835 (and its implementation guidance) establishes the basis for protection from ionizing radiation in controlled areas. _____

6. The purpose of this Order/Notice was to establish policies for materials transportation and packaging. _____

7. This Order/Notice established personnel responsibilities for departmental radiological performance. _____

8. The purpose of this Order/Notice is to protect the public and the environment against risk of radiation from DOE or DOE contractor facility operations. _____

9. This Order/Notice requires that the DOELAP is maintained to standards and that the dosimetry program is accredited. _____

10. This Order/Notice was initially issued as a requirement for radiation protection, but is now considered a guidance document. _____

11. This Order/Notice establishes the ACL of 2 rem TEDE per year for occupational exposure. _____

12. This Order/Notice addresses residual radioactive material. _____

13. Which Order/Notice would you consult if your job included developing new packaging for radioactive materials? _____

14. Which Order/Notice would you consult if your job included determination of concentrations of a radionuclide in air or water?

    a. occupational _____

    b. environmental _____

Activity Solution

A. DOE Order 1540.3A, *Base Technology for Radioactive Material Transportation Packaging System*

B. DOE Order 5400.5, *Radiation Protection of the Public and the Environment*

C. DOE/EH-0256T (Revision 1), *Radiological Control Manual*

D. DOE Order 5480.11, *Radiation Protection for Occupational Workers*

E. DOE Order 5480.15, *Department of Energy Laboratory Accreditation Program for Personnel Dosimetry*

F. DOE Notice 441.1, *Radiological Protection for DOE Activities*

G. DOE Order 460.2, *Departmental Materials Transportation and Packaging Management*

1. These two Orders/Notices have been superseded by DOE N441.1. C D E

2. This Order/Notice established training requirements for personnel responsible for performing radiological work activities. D

3. This Order/Notice establishes the standard of 100 mrem EDE per year exposure above background for members of the public. B

4. This Order/Notice has been superseded by DOE Order 460.2. A

5. This Order/Notice and 10 CFR 835 (and its implementation guidance) establishes the basis for protection from ionizing radiation in controlled areas. F

6. The purpose of this Order/Notice was to establish policies for materials transportation and packaging. G

7. This Order/Notice established personnel responsibilities for departmental radiological performance. D

8. The purpose of this Order/Notice is to protect the public and the environment against risk of radiation from DOE or DOE contractor facility operations. B

9. This Order/Notice requires that the DOELAP is maintained to standards and that the dosimetry program is accredited. F

10. This Order/Notice was initially issued as a requirement for radiation protection, but is now considered a guidance document. C

11. This Order/Notice establishes the ACL of 2 rem TEDE per year for occupational exposure. C

12. This Order/Notice addresses residual radioactive material. B

13. Which Order/Notice would you consult if your job included developing new packaging for radioactive materials? G

14. Which Order/Notice would you consult if your job included determination of concentrations of a radionuclide in air or water?

    a. occupational F

    b. environmental B

4. SUGGESTED ADDITIONAL READINGS AND /OR COURSES

Readings

- DOE/DP-0064*, Transporting Radioactive Materials.*

Courses

- DOE/EH-0450 (Revision 0*), Radiological Assessors Training (for Auditors and Inspectors) - Fundamental Radiological Control,* sponsored by the Office of Defense Programs*, DOE*
- *Radiological Worker Training* -- DOE-EH.
- *Radiological Control Technician Training* -- DOE-EH.
- *Radiation Protection General Technical Base Qualification Standard Training* -- GTS Duratek.